PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-051878
(43)Date of publication of application : 25.02.1997

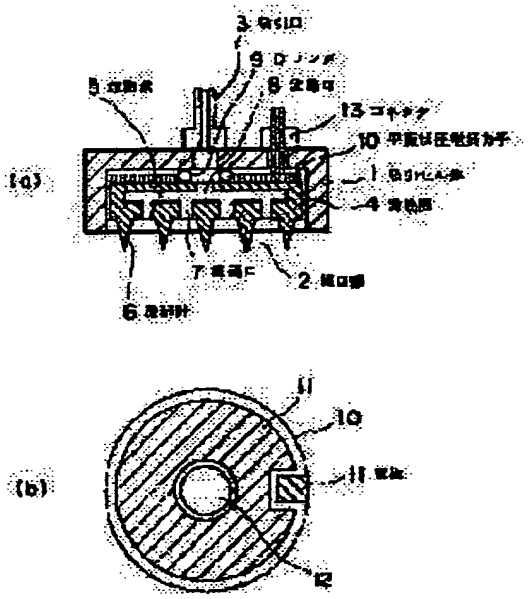
(51)Int.Cl. A61B 5/00
A61B 5/14
A61B 10/00

(21)Application number : 07-205460
(22)Date of filing : 11.08.1995

(71)Applicant : NEC CORP
(72)Inventor : KAJIWARA YUJI
KONDO YOJIRO

(54) EXUDATION LIQUID SUCKING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To suck and sample exudation liquid only by cleaning work by providing plural micro thin needles in a passage plate coming in contact with a living body surface and fitted in the opening part of a suction cell which sucks the exudation liquid and an oscillator which oscillates the micro thin needle.
SOLUTION: This exudation liquid sucking device is formed in such a way that a passage groove 5 is formed on the suction port 3 side of the passage plate 4 from a center in radial shape, and the passage plate 4 in which plural conical micro thin needles 6 are formed on an opening part 2 side is installed in the opening part 2 of the suction cell 1. Plural through ports 7 are formed among the micro thin needles 6 piercing through the passage groove 5. While, a passage port 8 is formed in the center of the passage plate 4, to which the suction port 3 is connected. A flat plate shape piezoelectric oscillator 10 is placed on the passage plate 4, and its center part is fixed. A hollow part 12 is provided in the center part of the piezoelectric oscillator 10 to evade a part equivalent to the passage port 8 of the passage plate 4. Two electrodes 11 to supply electric energy for excitation are installed in plane fashion on the upper surface of the piezoelectric oscillator 10, and wiring from the upper part of the suction cell to a connector 13 is performed.



LEGAL STATUS

[Date of request for examination]	11.08.1995
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	2713255
[Date of registration]	31.10.1997
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES * JP 09 051878

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the decoction aspirator used for it being bloodless and extracting especially the body fluid of a minute amount about the decoction aspirator which attracts and extracts a decoction in the living body.
[0002]
[Description of the Prior Art] Generally, continuity measurement of chemical concentration in the living body, such as the conventional, for example, glucose in the living body, concentration or the blood sugar level, collected blood, and was measured by the sensor of exclusive use. It was characterized by the ability also of a minute amount sample to measure [for this measuring method to measure the concentration using the biosensor equipped with the immobilized-enzyme electrode, and / if a biosensor is a minute dimension] it to a high sensitivity.
[0003] Therefore, these measuring methods can be used for the sick diagnosis by measurement of the concentration of the organic component contained in the medicine and the field of a diagnosis or biochemistry, for example, plasma, urine, etc., and the health care. However, sufficient attention to risk, such as infection and bleeding, had to be paid as well as offer of a patient's pain accompanied by blood collecting, and the effort by the side of the medicine.
[0004] Recently, the horny layer of the skin is locally removed as the extraction technique which softens the pain by the side of this patient, and the effort by the side of the medicine, body fluid is extracted from the fraction, and the technique of measuring a constituent concentration by the sensor was developed in this decoction. an example of this technique -- NEC technical report Vol.16 and No.9 (1993) -- it is indicated by the 91st page from the 83rd page
[0005] This technique makes the interstitial fluid attracted from the skin which exfoliated the horny layer react with the immobilized-enzyme layer on an ion sensitivity field-effect transistor (ISFET), and measures glucose concentration by the reaction degree. The decoction aspirator was used for extracting the decoction which is the interstitial fluid required for this measurement.
[0006] Drawing 7 is sectional drawing of the decoction aspirator which shows a conventional example. The decoction extraction equipment currently indicated by JP,4-341241,A carried out the interior of the mesh made from nylon 14 called the spacer fixed by the frame 13 in the opening 2 in contact with the skin of the suction cell field 1 which attracts a decoction, as shown in drawing 7 , and it was characterized by exhausting from the suction opening 3 and extracting a decoction.
[0007]
[Problem(s) to be Solved by the Invention] The conventional decoction aspirator mentioned above removes the horny layer of a skin side, after it exposes the skin side called dermis, it attracts it, and it extracts a decoction.
[0008] The thickness of a horny layer and the status have personal equation, such as a site of age, sex, a living environment, and the body, and cannot be specified. Usually, it is the organization of the best layer where there are about 10-30 micrometers in the case of a crossarm, and the skin is metabolized.
[0009] In order to remove this horny layer, it is failed mechanically to press an adhesive tape against a skin side mechanically, or to rub a skin side, or the work to strip is repeated and performed. Since there is personal equation as mentioned above, it is generated, and dispersion may follow an ache on it by the case rather than may be fixed to the duration.
[0010] Time for the grade of horny-layer elimination to carry out suction exudation of the decoction will be influenced, and exudation luminous efficacy will be decided. For example, if it is in obtaining the decoction of 10microl also at the time of 15 minutes even if it is the same people, it may be required about 1 hour.
[0011] Furthermore, in case a horny layer is removed, after pretreatment of cleanings, such as a degreasing and psilosis, is required and carrying out suction exudation by the site, clinical processing which suppresses inflammation is needed.
[0012] Therefore, the purpose of this invention is to offer the decoction aspirator which can extract efficiently easily the body fluid extracted from in the living body.
[0013]
[Means for Solving the Problem] In order for the decoction aspirator of this invention to leach a decoction from an organism front face, while it has opening in the field side which contacts directly the suction opening which carries out suction reduced pressure, and the above-mentioned organism front face In a decoction aspirator equipped with the passage plate which fitting fixation is carried out and contacts on the direct above-mentioned organism front face in the above-mentioned opening, and the vibrator installed in the inside of the above-mentioned opening, or the exterior in order to excite this passage plate While the above-mentioned vibrator is installed in the above-mentioned suction opening side of the above-mentioned passage plate, it is

characterized by forming two or more minute needles and penetration openings in the field which contacts the above-mentioned organism front face of the above-mentioned passage plate directly.

[0014]

[Embodiments of the Invention] Next, this invention is explained with reference to a drawing.

[0015] Drawing 1 (a) is sectional drawing showing the gestalt of operation of the 1st of the decoction aspirator of this invention. This decoction aspirator is installed in the opening 2 of the suction cell field 1 in the passage plate 4 with which the passage slot 5 was formed in the suction opening 3 side of the passage plate 4 from the center at the radial, and two or more cone-like detailed needles 6 were formed in the opening 2 side. Two or more penetration openings 7 are formed between the detailed needles 6, and it has penetrated into the passage slot 5. On the other hand on this passage plate 4, the passage opening 8 is formed in the center, and it connects with the suction opening 3. Since the exudation luminous efficacy of a decoction and liquid-sending luminous efficacy are influenced if the passage opening 8 leaks from a suction system, between the suction cell field 1 and the passage opening 8 of the passage plate 4, the seal is carried out through O ring 9.

[0016] Furthermore, on this passage plate 4, the plate-like piezoelectric transducer 10 is laid and the core is fixed. In order to avoid the fraction equivalent to the passage opening 8 of the passage plate 4, the core of the piezoelectric transducer 10 provides the centrum 12, as shown in drawing 1 (b). In order to excite, two electrodes 11 which supply electrical energy are superficially installed in piezoelectric-transducer 10 top, and are wired by the connector 13 from the upper part of a suction cell.

[0017]

[Example] In such a decoction aspirator of structure, the number of the detailed needle 6 formed in 30mm, the thickness of 0.5mm, the length of 30 micrometers of the detailed needle 6, 20 micrometers of ****s, pitch 0.1mm, 50 micrometers of penetration opening 7 diameters then, and the passage plate 4 in the outer diameter of the passage plate 4 and the penetration openings 7 becomes about about 80,000 pieces, respectively. If suction reduced pressure (for example, 0.5atms) is carried out from the suction opening 3, a skin side will be decompressed via the passage opening 8, the passage slot 5, and the penetration opening 7, and will be pushed against a skin side by the passage plate 4. Furthermore, if alternating voltage is impressed to a piezoelectric transducer 10 at this time and longitudinal oscillation is added, the passage plate 4 currently contacted and installed is excited, the detailed needle 6 will trespass upon the horny layer of the skin, a horny layer will be penetrated, and the nose of cam of the detailed needle 6 will reach the dermis in which the interstitial fluid which should exude at least exists. Although the personal equation has the thickness of a horny layer, it is called 10-30 micrometers, and the thickness of the dermis of the subsystem cell is several 10 micrometers further. The detailed needle 6 does not bleed in order not to reach the site with a capillary, since only the needle length permeates into the skin. Although the nose of cam of the detailed needle 6 has the sharper desirable one, since excitation is continued also for reliance by several micrometers, easily, it is gradually invaded into the amount of displacement in the skin, and it stops with the 7th page of the penetration opening. Moreover, usually, it is dry with the best layer last gestalt of an organism cell, and the horny layer is deposited in the shape of [of the diameter of 10 micrometers of divisors] **. The diameter and pitch of the detailed needle 6 and the penetration opening 7 have chosen the domain which can be created by the method [process / etching / it] for having used photolithography technique easily etc. in this example, although the minute dimension is suitable only in the inside of possible.

[0018] If suction and excitation are continued in such the status, the detailed needle 6 will reach a dermis and the interstitial fluid will exude from between the detailed needle 6 and the skin side faces. Since it has excited, between the detailed needle 6 and the skin contact surface, space occurs temporarily and the phenomenon in which a decoction tends to exude is presented.

[0019] Therefore, the work which had spent elimination of a horny layer conventionally for a long time is not only omissible, but even if the personal equation is in a keratin thickness, the effect which variation does not generate is in decoction exudation luminous efficacy. For example, when measuring change of the glucose constituent concentration in the sanguis within a day, the required requirements of a decoction are enabled 10microl, then to be stabilized and to carry out in 15 or less minutes, although it hit once and time progress of 15 to about 30 minutes was needed by the personal equation. The resolution to the time of the status that glucose concentration changes improves, and the precision of a clinical diagnosis also improves.

[0020] The piezoelectric transducer 10 for exciting vibration to the passage plate 4 sets to about 30mm with the diameter and equivalent dimension of the passage plate 4, and is contained in opening 2. If the configuration is made into the shape of a circular plate, for example, ceramic sintered compacts, such as a barium titanate of 0.5mm ** and titanic-acid zircon ****, are used, since it can perform perpendicular excitation easily from audio frequency to a ultrasonic wave and **********, the easy piezoelectric transducer of structure can be obtained. Since the way which set up especially the frequency of operation highly with 1kHz or more seldom comes to receive the influence of the resonance frequency of a suction cell mainframe, the effective thing is clear from the principle.

[0021] Drawing 2 is a 1 pattern view of the electrode of the piezoelectric transducer of drawing 1 . As this piezoelectric transducer is shown in drawing 2 , electrode 11 pattern is formed in a radial independently [two or more]. If it is made to operate so that voltage impression may be carried out succeeding between the electrodes 11 of fellow next doors, a variation rate will occur in the orientation in which it has been arranged between electrodes, and it will be enabled to excite to homogeneity from near a center to near a disk edge. since the core is being fixed with the structure which was shown in drawing 1 -- the biggest variation rate -- the fraction which shows an amount is near a disk edge -- receiving -- the detailed needle 6 of the passage plate 4 -- there is the characteristic feature with which all can vibrate with an equivalent amplitude Therefore, extraction of a minute amount decoction is attained from the whole region of a passage plate, and it is effective in extraction luminous efficacy improving further.

[0022] Drawing 3 is sectional drawing showing the gestalt of operation of the 2nd of the decoction aspirator of this invention. As shown in drawing 3 , in the opening 2 of the suction cell field 1, this decoction aspirator is installed so that the in-a-circle

piezoelectric transducer 20 may be fitted in, it is further inscribed in this piezoelectric transducer 20, and is fixing the passage plate 4.

[0023] Such a decoction aspirator of structure gives horizontal vibration to the passage plate 4. That is, the in-a-circle piezoelectric transducer 20 carries out in the thickness of 2mm, the bore of 26mm, and outer diameter of 30mm, installs an electrode in the wall section and the outer wall section side face, and impresses alternating voltage to this fraction. A piezoelectric transducer 20 also serves as the source of an operation which goes up and down the passage plate 4 at the same time it gives vibration which ****s the passage plate 4 to a medial axis. Moreover, the effect to which elongate the skin side itself and it is made to reduce is also generated. The detailed needle 6 of the passage plate 4 at this time does not have the perpendicularly sharp not necessarily need, it is horizontally sharp, for example, even if it is **** of the arrow form configuration which patternized the thick film whose thickness is about 30 micrometers, it becomes possible to make a horny layer penetrate.

[0024] Therefore, the effect shown in the gestalt of the 1st operation is acquired similarly, and also the space occurrence between the detailed needle 6 and a horny layer is expanded by excitation of the effect of expanding a skin side, and the passage plate 4 to a horizontal direction, and enhancement in exudation luminous efficacy is further realized.

[0025] Drawing 4 is sectional drawing showing the gestalt of operation of the 3rd of the decoction aspirator of this invention. As shown in drawing 4 , this decoction aspirator is installed so that the piezoelectric transducer 20 (bore 2r) in a circle may be fitted in in the opening 2 of the suction cell field 1, and the knockout section 21 (outer-diameter 2r) in a circle is fixed, and it is prepared in the internal surface of parietal bone of this piezoelectric transducer 20. The internal-surface-of-parietal-bone side of this knockout section 21 has a cone angle (alpha) 25, as shown in this drawing, and it has the structure which touches the passage plate 4 which prepared the same cone angle in the periphery. It is loop **** about vibration in which the bore has maximum 2 (r+deltar) and the minimum value 2 (r-deltar) when the piezoelectric transducer 20 of bore 2r in a circle excites in the gestalt of this 3rd operation. The knockout section 21 in a circle fixed and prepared in the piezoelectric transducer 20 by flexible movement of this orientation of a path causes flexible movement of the orientation of a path similarly, and has the structure of vibrating the passage plate 4 which has touched through the cone angle 25 to a Z direction. Specifically, when radius r of the knockout section 21 contracts to r-deltar, through the taper fraction of angle alpha, the passage plate 4 is extruded by the sense (this drawing down) of +Z, and the knockout distance (deltaZ) is set to deltaZ=deltarxtanalpha. Moreover, if the radius of the knockout section 21 is expanded, the passage plate 4 is put back to - Z direction by the elasticity of the skin, and the passage plate 4 has loop **** structure in vibration (deltaZ=**deltarxtanalpha) as a result at the Z direction.

[0026] In the gestalt of the 3rd operation, it has the structure which prepared this cone angle (alpha) and to which the amount (deltar) of displacement of a piezoelectric transducer 20 is expanded. If cone-angle alpha is taken at 45 degrees or more, it will become the structure of expanding amount [of displacement] deltar. For example, at alpha= 60 degrees, in 1.73 times and alpha= 70 degrees, at 2.75 times and alpha= 80 degrees, it can expand by 5.67 times, and can expand by 11.4 times by alpha= 85 degrees. The detailed needle 6 with about 2-micrometer stroke was able to be obtained by making a cone angle (alpha) into 85 degrees using the deltar=0.2micrometer piezoelectric transducer 20. It was important to have improved slipping of the taper section, in order to vibrate the detailed needle 6 smoothly, and in order to smooth a taper side enough (desirably mirror-plane status) and to acquire a lubricous effect, minute amount ON ******** etc. was effective for the taper side in the medicinal oil usually used (desirably low viscosity).

[0027] It has the effect that enable it to use a smaller piezoelectric transducer and a miniaturization design of a decoction aspirator becomes easy, by giving the expansion function of the amount of displacement which was stated with the gestalt of the 3rd operation to a decoction aspirator.

[0028] In addition, with the gestalt of this operation, although the shape of a disk was made into the configuration of a suction cell, the same effect was acquired also in the rectangle-like suction cell, without being limited to this.

[0029] It is sectional drawing showing the gestalt of operation of the 4th of the decoction aspirator of this invention in drawing 5 . The disk-like piezoelectric transducer 30 is installed on the outskirts of suction opening 3 of the exterior of the suction cell mainframe 1, and this decoction aspirator is fixing to them, as shown in drawing 4 . It is equivalent to the gestalt of the 1st operation that the passage plate 4 has fitted into the opening 2 of the suction cell field 1, and the detailed needle 6 and the penetration opening 7 are formed in the opening 2 side of this passage plate 4.

[0030] Such a decoction aspirator of structure vibrates the electrode formed in the vertical side of the disk-like piezoelectric transducer 30 installed in the exterior of the suction cell field 1 by impressing alternating voltage. The suction cell field 1 whole is excited by this, the detailed needle 6 penetrates to a horny layer, and it enables the interstitial fluid to exude from the penetration opening 7.

[0031] Therefore, the effect shown in the decoction aspirator shown in the gestalt of the 1st operation is easy assembly by being obtained similarly, and also installing a piezoelectric transducer 30 in the exterior of the suction cell field 1, and since it is not necessary to carry out interior into opening 2, the difficulty of a design and a manufacture is mitigated especially about the precision of an outer-diameter dimension.

[0032] It is sectional drawing showing the gestalt of operation of the 5th of the decoction aspirator of this invention in drawing 6 . This decoction aspirator is installing the in-a-circle piezoelectric transducer 40 on the passage plate 4 in the opening 2 of the suction cell field 1, as shown in drawing 6 . It fits into the opening side face and has fixed, for example, supposing the periphery edge of a passage plate is opening 2 diameter with a diameter of 30mm, with a bore [of 20mm], and an outer diameter of 25mm like, the in-a-circle piezoelectric transducer 40 will be made into the dimension which chose only radius l small, and it will stick it on a passage plate, for example. The impression electrode to the in-a-circle piezoelectric transducer 40 is installed in a vertical side, to the impression electric field, is parallel and is made into the piezoelectric transducer 40 to which a perpendicular vibration

happens to the passage plate 4.
[0033] Supposing the fraction in which the piezoelectric transducer 40 is laying such a vibration amplitude of the passage plate 4 of the decoction aspirator of structure is 1 micrometer, the amount of core will increase in one about 4 times the amplitude of about 4 micrometers of this. That is, it will have an amplitude amplification function. Although the amount of core becomes a peak swing, since the amplitude of vertical vibration is large, there is a merit which the detailed needle 6 becomes easy to invade into a horny layer, and can also drive the voltage impression by the small voltage easily conversely.
[0034] Although the gestalt of operation was shown above and the freshness by the configuration of this invention was explained, it is not limited to these. for example, -- although the shape of a plate and the in-a-circle piezoelectric transducer were used, even if it combines these and it divides and installs this in plurality superficially, and also the same effect is acquired -- instead of piezoelectric device] -- electromagnetism -- you may use vibrator Moreover, although the opening bore of a suction cell was set to about 30mm and the outer diameter of a passage plate and a piezoelectric transducer was decided corresponding to the dimension, in order to make it contrast with the conventional mesh and to compare the effect, it is the dimension set up temporarily, and it cannot adhere to this and can select arbitrarily.
[0035] Furthermore, when the configuration of a detailed needle adds vibration also with the detailed needle of the shape of the shape of a multiple drill, and a circular cylinder, and these combination configurations, it can be made to trespass upon a horny layer easily, although explained as the shape of a cone, and an arrow configuration.
[0036]
[Effect of the Invention] The effect that the suction extraction of the decoction can be carried out only by easy pure work, without removing the horny layer of a skin side by installing the vibrator which forms two or more detailed needles in the passage plate which fits into opening of the suction cell field which this invention contacts an organism front face and attracts a decoction, and excites the detailed needle as explained above is acquired. Moreover, since a horny layer was not removed, although the extraction luminous efficacy of a decoction had produced conventionally big variation by the grade of elimination of a horny layer, this is lost and it also has the effect that the extraction luminous efficacy which the personal equation decreased and was stabilized is acquired.

[Translation done.]

* NOTICES *

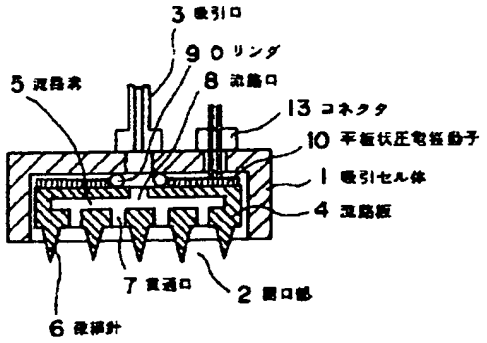
CLAIMS

[Claim(s)]
[Claim 1] The suction opening for leaching a decoction from an organism front face which carries out suction reduced pressure, and the suction cell field which has opening in the above-mentioned organism front face at the field side which contacts directly, In a decoction aspirator equipped with the passage plate which is fixed in the above-mentioned opening and contacts the direct above-mentioned organism front face, and the vibrator installed in the inside of the above-mentioned opening, or the exterior in order to excite this passage plate The decoction aspirator characterized by forming two or more minute needles and penetration openings in the field which contacts the above-mentioned organism front face of the above-mentioned passage plate directly while the above-mentioned vibrator is installed in the above-mentioned suction opening side of the above-mentioned passage plate.
[Claim 2] The above-mentioned vibrator is a decoction aspirator according to claim 1 characterized by being a piezoelectric transducer.
[Claim 3] The above-mentioned piezoelectric transducer is a decoction aspirator according to claim 2 characterized by two or more electrodes for voltage impression being installed in one flat surface by the radial.
[Claim 4] The above-mentioned piezoelectric transducer is a decoction aspirator according to claim 2 characterized by being installed on above-mentioned the outskirts of the suction opening of the above-mentioned suction cell field upper part.
[Claim 5] The decoction aspirator according to claim 1 characterized by installing in-a-circle vibrator in the periphery of the above-mentioned passage plate.
[Claim 6] The above-mentioned piezoelectric transducer is a decoction aspirator according to claim 2 characterized by being installed inside the supporting point of the above-mentioned passage plate.

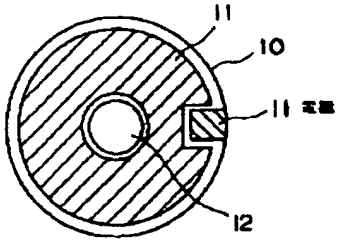
[Translation done.]

Drawing selection Drawing 1

(a)

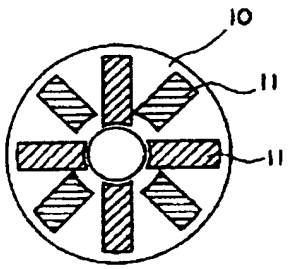


(b)



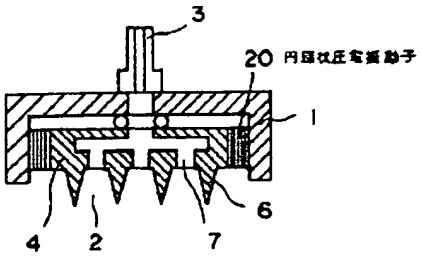
[Translation done.]

Drawing selection: Drawing 2



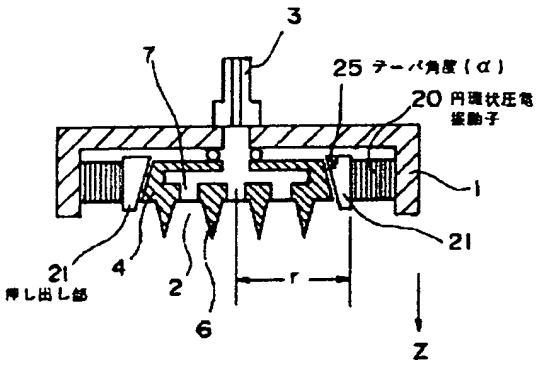
[Translation done.]

Drawing selection Drawing 3



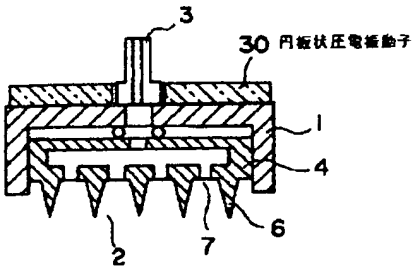
[Translation done.]

Drawing selection Drawing 4



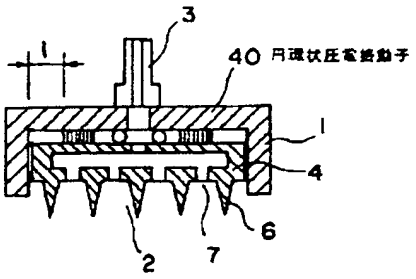
[Translation done.]

Drawing selection Drawing 5



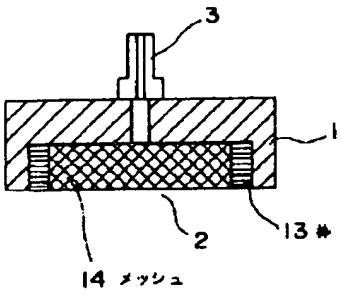
[Translation done.]

Drawing selection Drawing 6



[Translation done.]

Drawing selection Drawing 7



[Translation done.]

ELECTROSTIMULATION DEVICE

Patent Number:	SU1667864
Publication date:	1991-08-07
Inventor(s):	DEMCHENKO OLEG I (SU); ILYASHCHEV GRIGORIJ I (SU); MOVCHAN YURIJ V (SU); OLSHA VYACHESLAV A (SU); TOLKACHEV VLADIMIR F (SU); TROITSKIJ OLEG A (SU)
Applicant(s)::	Z ENERGET MASH O (SU)
Requested Patent:	SU1667864
Application Number:	SU19894696789 19890323
Priority Number(s):	SU19894696789 19890323
IPC Classification:	A61H11/00 ; A61H39/08
EC Classification:	
Equivalents:	

Abstract

Search statement 1

?fam su1667864/pn

** SS 1: Results 1

Search statement 2

?prt full

1/1 WPAT - (C) Derwent
AN - 1992-224775 [27]
XP - N1992-170693
TI - Electric stimulator - working ends of needles of different groups are arranged in two parallel planes
DC - P33 S05
PA - (POWE=) POWER EQUIP EXP WKS
IN - DEMCHENKO OI; ILYASHEV GI; MOVCHAN YU V
NP - 1
NC - 1
PN - SU1667864 A1 19910807 DW1992-27 A61H-039/08 3p *
AP: 1989SU-4696789 19890323
PR - 1989SU-4696789 19890323
IC - A61H-039/08 A61H-011/00
AB - SU1667864 A

The needles are mounted on a base composed of two electrically conductive layers (1,2), separated by a dielectric lining (4). In the upper layer (2) of the base there are apertures arranged in chequerboard array between the upper layer needles and holding the needles (5) attached in the lower layer (1). The needles of the two groups linked to different layers (1,2) are electrically insulated from each other and joined to different outputs of the pulse generator (3).

- The working ends of the needles of different groups are arranged in two parallel planes, the distance between which is 0.15-0.3 of the distance between the working ends of the nearest needles of one group. The electric stimulator has a current indicator (10) joined in series to the pulse generator (3).
- USE - As an electric stimulator to increase the fitness of sportsmen. Bul. 29/76.8.91 (Dwg.1/3)

MC - EPI: S05-A04
UP - 1992-27